Brain Stroke Analysis Using Python

I'm thrilled to share the successful completion of a groundbreaking Brain Stroke Analysis project! Here are the key highlights of my work:

🔍 Null Value Handling: Identified and meticulously addressed null values within the dataset to ensure impeccable data integrity and accuracy, laying a robust foundation for further analysis.

📈 In-depth Analysis: Conducted a thorough and insightful analysis to decipher patterns and trends related to brain stroke occurrences, providing valuable insights into this critical healthcare domain.

🔧 Data Manipulation Expertise: Employed advanced data manipulation techniques to fill missing values and optimize data quality, enhancing the reliability and usefulness of the dataset.

🚀 Python Libraries Mastery: Leveraged powerful Python libraries including Pandas and NumPy for seamless data preprocessing and cleaning, streamlining the analysis process and maximizing efficiency.

📊 Visualization Proficiency: Utilized state-of-the-art visualization tools such as Matplotlib and Seaborn to craft visually engaging charts and graphs, effectively communicating complex insights to stakeholders.

Import Library

In [1]:
```
import pandas as pd
```

In [2]:
```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import seaborn as sns
```

```
C:\Users\Syed Arif\anaconda3\lib\site-packages\scipy\__init__.py:146: UserWarnin
g: A NumPy version >=1.16.5 and <1.23.0 is required for this version of SciPy (d
etected version 1.25.1
  warnings.warn(f"A NumPy version >={np_minversion} and <{np_maxversion}"
```

Uploading Csv fle

In [3]:
```
df = pd.read_csv(r"C:\Users\Syed Arif\Desktop\healthcare-dataset-stroke-data.csv"
```

Data Preprocessing

.head()

head is used show to the By default = 5 rows in the dataset

In [4]:
```
df.head()
```

Out[4]:

	id	gender	age	hypertension	heart_disease	ever_married	work_type	Residence_type	avg_
0	9046	Male	67.0	0	1	Yes	Private	Urban	
1	51676	Female	61.0	0	0	Yes	Self-employed	Rural	
2	31112	Male	80.0	0	1	Yes	Private	Rural	
3	60182	Female	49.0	0	0	Yes	Private	Urban	
4	1665	Female	79.0	1	0	Yes	Self-employed	Rural	

.tail()

tail is used to show rows by Descending order

In [5]:
```
df.tail()
```

Out[5]:

	id	gender	age	hypertension	heart_disease	ever_married	work_type	Residence_type	a
5105	18234	Female	80.0	1	0	Yes	Private	Urban	
5106	44873	Female	81.0	0	0	Yes	Self-employed	Urban	
5107	19723	Female	35.0	0	0	Yes	Self-employed	Rural	
5108	37544	Male	51.0	0	0	Yes	Private	Rural	
5109	44679	Female	44.0	0	0	Yes	Govt_job	Urban	

.shape

It show the total no of rows & Column in the dataset

In [6]:
```
df.shape
```

Out[6]:
```
(5110, 12)
```

.Columns

It show the no of each Column

In [7]:
```
df.columns
```

Out[7]:
```
Index(['id', 'gender', 'age', 'hypertension', 'heart_disease', 'ever_married',
       'work_type', 'Residence_type', 'avg_glucose_level', 'bmi',
       'smoking_status', 'stroke'],
      dtype='object')
```

.dtypes

This Attribute show the data type of each column

In [8]:
```
df.dtypes
```

Out[8]:
```
id                   int64
gender              object
age                float64
hypertension         int64
heart_disease        int64
ever_married        object
work_type           object
Residence_type      object
avg_glucose_level  float64
bmi                float64
smoking_status      object
stroke               int64
dtype: object
```

.unique()

In a column, It show the unique value of specific column.

In [9]:
```
df["work_type"].unique()
```

Out[9]:
```
array(['Private', 'Self-employed', 'Govt_job', 'children', 'Never_worked'],
      dtype=object)
```

.nuique()

It will show the total no of unque value from whole data frame

In [10]:
```
df.nunique()
```

Out[10]:
```
id                 5110
gender                3
age                 104
hypertension          2
heart_disease         2
ever_married          2
work_type             5
Residence_type        2
avg_glucose_level  3979
bmi                 418
smoking_status        4
stroke                2
dtype: int64
```

.describe()

It show the Count, mean , median etc

In [11]:
```
df.describe()
```

Out[11]:

	id	age	hypertension	heart_disease	avg_glucose_level	bmi	
count	5110.000000	5110.000000	5110.000000	5110.000000	5110.000000	4909.000000	5110
mean	36517.829354	43.226614	0.097456	0.054012	106.147677	28.893237	0
std	21161.721625	22.612647	0.296607	0.226063	45.283560	7.854067	0
min	67.000000	0.080000	0.000000	0.000000	55.120000	10.300000	0
25%	17741.250000	25.000000	0.000000	0.000000	77.245000	23.500000	0
50%	36932.000000	45.000000	0.000000	0.000000	91.885000	28.100000	0
75%	54682.000000	61.000000	0.000000	0.000000	114.090000	33.100000	0
max	72940.000000	82.000000	1.000000	1.000000	271.740000	97.600000	1

.value_counts

It Shows all the unique values with their count

In [12]:
```
df["work_type"].value_counts()
```

Out[12]:
```
Private          2925
Self-employed     819
children          687
Govt_job          657
Never_worked       22
Name: work_type, dtype: int64
```

.isnull()

It shows the how many null values

In [13]:
```
df.isnull()
```

Out[13]:

	id	gender	age	hypertension	heart_disease	ever_married	work_type	Residence_type	a
0	False	False	False	False	False	False	False	False	
1	False	False	False	False	False	False	False	False	
2	False	False	False	False	False	False	False	False	
3	False	False	False	False	False	False	False	False	
4	False	False	False	False	False	False	False	False	
...	...	...	...	...	...	...	...	...	
5105	False	False	False	False	False	False	False	False	
5106	False	False	False	False	False	False	False	False	
5107	False	False	False	False	False	False	False	False	
5108	False	False	False	False	False	False	False	False	
5109	False	False	False	False	False	False	False	False	

5110 rows × 12 columns

.info()

To Show Data type of each column

In [14]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5110 entries, 0 to 5109
Data columns (total 12 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   id                 5110 non-null   int64  
 1   gender             5110 non-null   object 
 2   age                5110 non-null   float64
 3   hypertension       5110 non-null   int64  
 4   heart_disease      5110 non-null   int64  
 5   ever_married       5110 non-null   object 
 6   work_type          5110 non-null   object 
 7   Residence_type     5110 non-null   object 
 8   avg_glucose_level  5110 non-null   float64
 9   bmi                4909 non-null   float64
 10  smoking_status     5110 non-null   object 
 11  stroke             5110 non-null   int64  
dtypes: float64(3), int64(4), object(5)
memory usage: 479.2+ KB
```

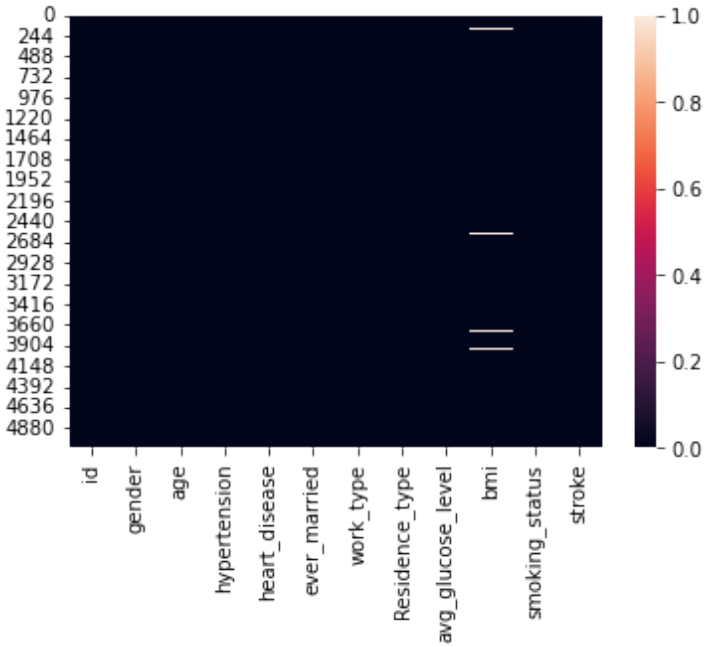
Is there any Null value present in any Column ? Show with heatmap

In [15]:
```
df.isnull().sum()
```

Out[15]:
```
id                   0
gender               0
age                  0
hypertension         0
heart_disease        0
ever_married         0
work_type            0
Residence_type       0
avg_glucose_level    0
bmi                201
smoking_status       0
stroke               0
dtype: int64
```

In [16]:
```
sns.heatmap(df.isnull())
```

Out[16]:
```
<AxesSubplot:>
```



Change the Numeric values to categorical

In [25]:
```
# Replace 'yes' with 1 and 'no' with 0 in the specified column
df['hypertension'] = df['hypertension'].replace({1: 'yes', 0: 'no'})
```

In [26]:
```
df.dtypes
```

Out[26]:
```
id                   int64
gender              object
age                float64
hypertension        object
heart_disease        int64
ever_married        object
work_type           object
Residence_type      object
avg_glucose_level  float64
bmi                float64
smoking_status      object
stroke               int64
dtype: object
```

In [27]:
```
# Replace 'yes' with 1 and 'no' with 0 in the specified column
df['heart_disease'] = df['heart_disease'].replace({1: 'yes', 0: 'no'})
```

In [28]:
```
# Replace 'yes' with 1 and 'no' with 0 in the specified column
df['stroke'] = df['stroke'].replace({1: 'yes', 0: 'no'})
```

Bar Graph

In [29]:
```
df
```

Out[29]:

	id	gender	age	hypertension	heart_disease	ever_married	work_type	Residence_type	a
0	9046	Male	67.0	no	yes	Yes	Private	Urban	
1	51676	Female	61.0	no	no	Yes	Self-employed	Rural	
2	31112	Male	80.0	no	yes	Yes	Private	Rural	
3	60182	Female	49.0	no	no	Yes	Private	Urban	
4	1665	Female	79.0	yes	no	Yes	Self-employed	Rural	
...	...	...	...	...	...	...	...	...	
5105	18234	Female	80.0	yes	no	Yes	Private	Urban	
5106	44873	Female	81.0	no	no	Yes	Self-employed	Urban	
5107	19723	Female	35.0	no	no	Yes	Self-employed	Rural	
5108	37544	Male	51.0	no	no	Yes	Private	Rural	
5109	44679	Female	44.0	no	no	Yes	Govt_job	Urban	

5110 rows × 12 columns

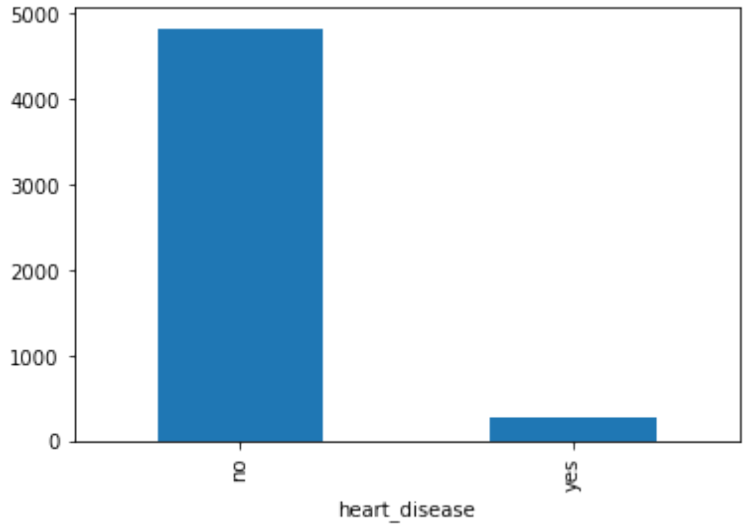
Count of Hear Disease

In [30]:
```
df.groupby("heart_disease").heart_disease.count()
```

Out[30]:
```
heart_disease
no     4834
yes     276
Name: heart_disease, dtype: int64
```

In [31]:
```
df.groupby("heart_disease").heart_disease.count().plot(kind = "bar")
```

Out[31]:
```
<AxesSubplot:xlabel='heart_disease'>
```



Convert the age column into categorical

In [35]:
```
# Apply conditions and replace values in the column
df['age'] = df['age'].apply(lambda x: 'Younger' if x < 18 else ('Young Adult' if
```

In [36]:
```
df
```

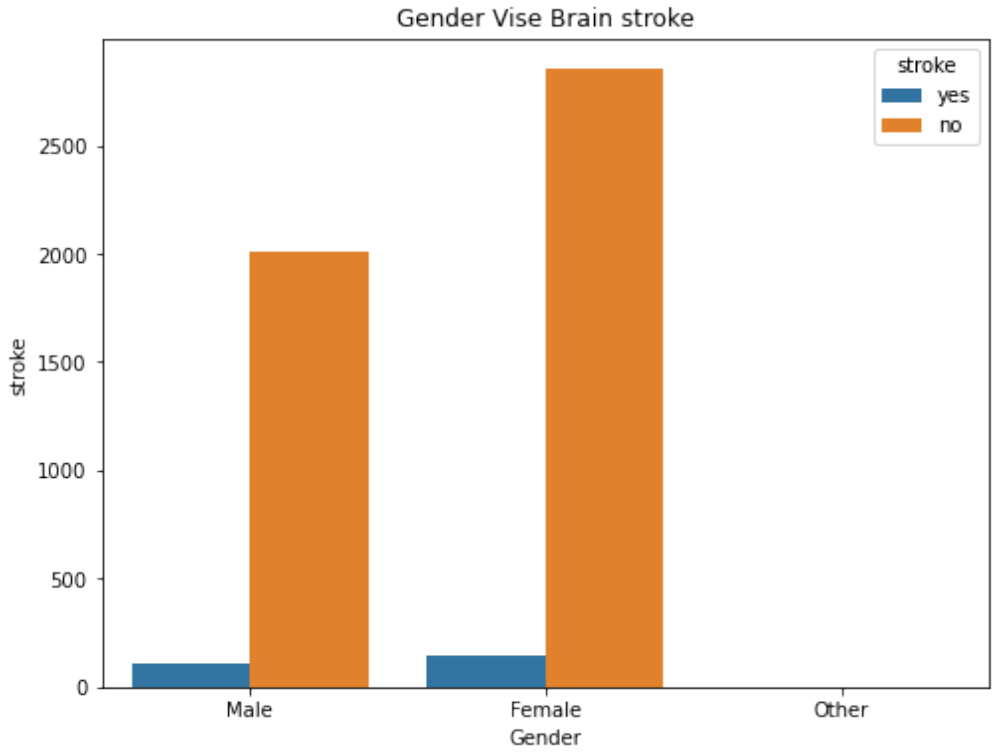
Out[36]:

	id	gender	age	hypertension	heart_disease	ever_married	work_type	Residence_type
0	9046	Male	Senior Adult	no	yes	Yes	Private	Urban
1	51676	Female	Senior Adult	no	no	Yes	Self-employed	Rural
2	31112	Male	Senior Adult	no	yes	Yes	Private	Rural
3	60182	Female	Adult	no	no	Yes	Private	Urban
4	1665	Female	Senior Adult	yes	no	Yes	Self-employed	Rural
...	...	...	...	...	...	...	...	...
5105	18234	Female	Senior Adult	yes	no	Yes	Private	Urban
5106	44873	Female	Senior Adult	no	no	Yes	Self-employed	Urban
5107	19723	Female	Senior Adult	no	no	Yes	Self-employed	Rural
5108	37544	Male	Senior Adult	no	no	Yes	Private	Rural
5109	44679	Female	Adult	no	no	Yes	Govt_job	Urban

5110 rows × 12 columns

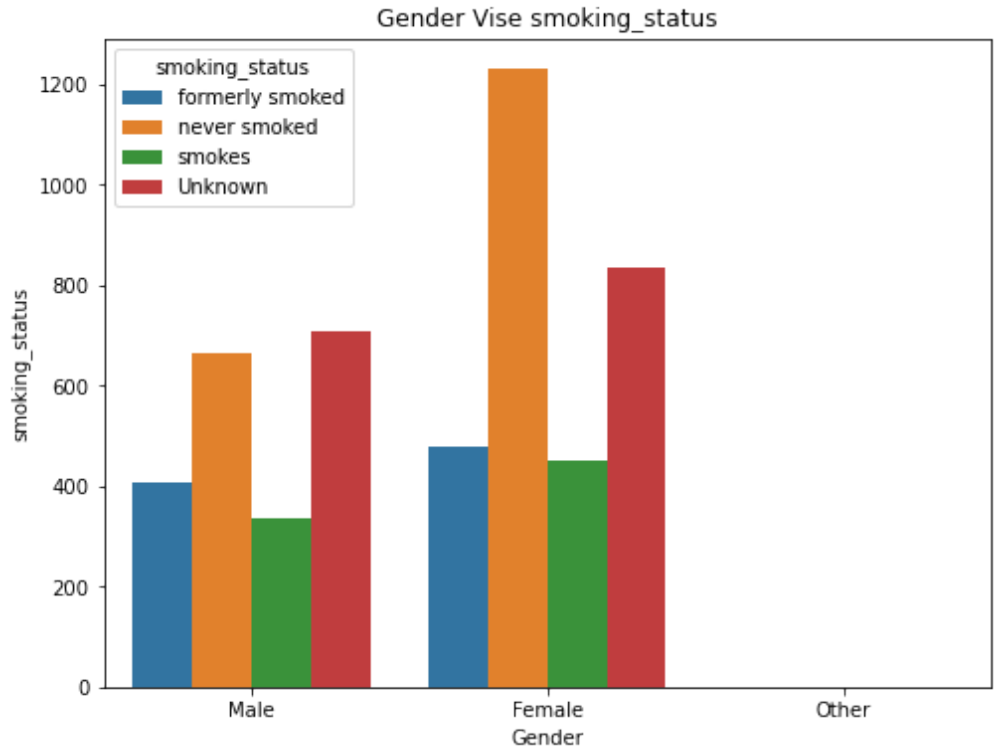
Gender Vise Count of Brain Stroke

In [38]:
```
plt.figure(figsize=(8, 6))
sns.countplot(data=df, x='gender', hue ="stroke")
plt.xlabel('Gender')
plt.ylabel('stroke')
plt.title('Gender Vise Brain stroke')
plt.show()
```



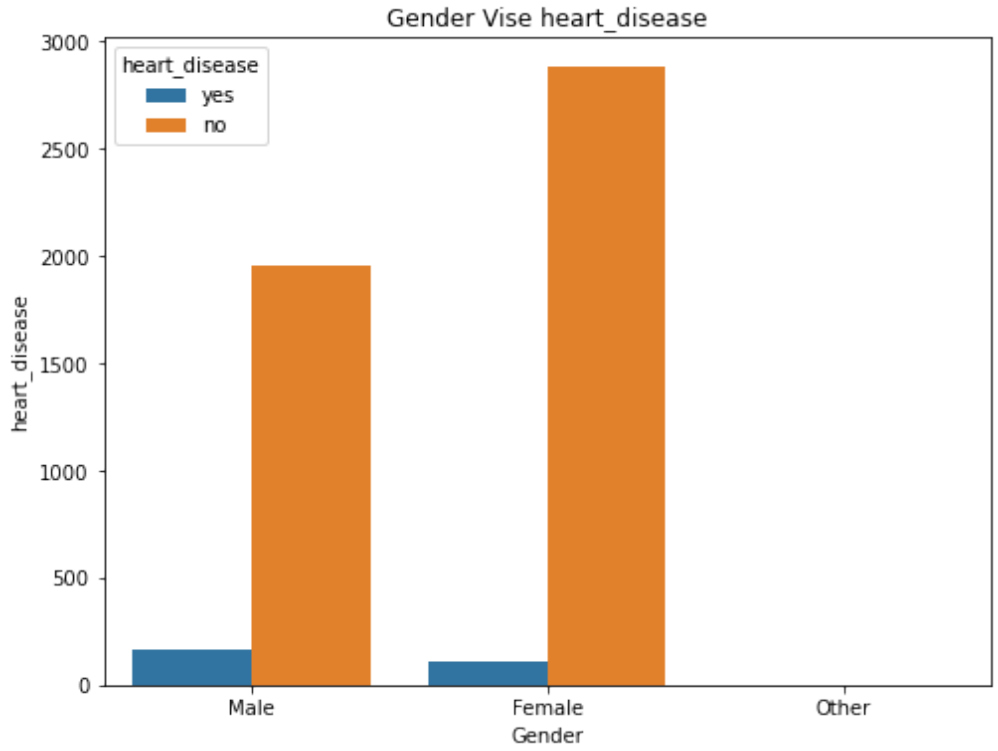
Gender Vise Count of Smoking Status

In [39]:
```
plt.figure(figsize=(8, 6))
sns.countplot(data=df, x='gender', hue ="smoking_status")
plt.xlabel('Gender')
plt.ylabel('smoking_status')
plt.title('Gender Vise smoking_status')
plt.show()
```



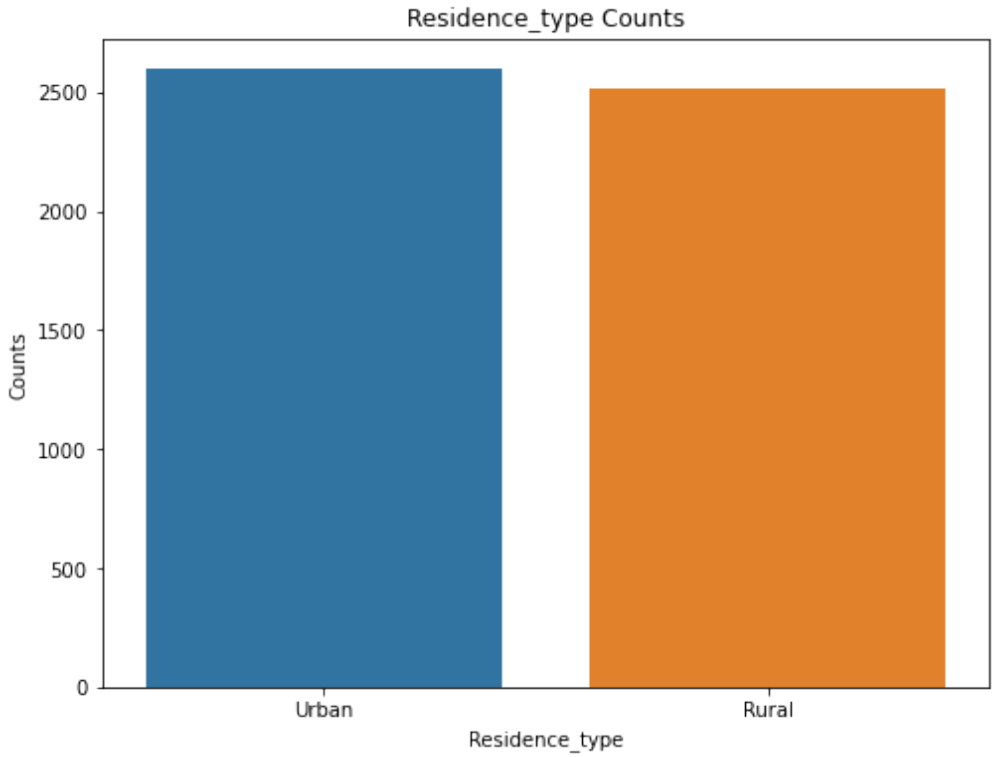
Gender Vise Count of Heart Disease

In [40]:
```
plt.figure(figsize=(8, 6))
sns.countplot(data=df, x='gender', hue ="heart_disease")
plt.xlabel('Gender')
plt.ylabel('heart_disease')
plt.title('Gender Vise heart_disease')
plt.show()
```



Count of Residency Type

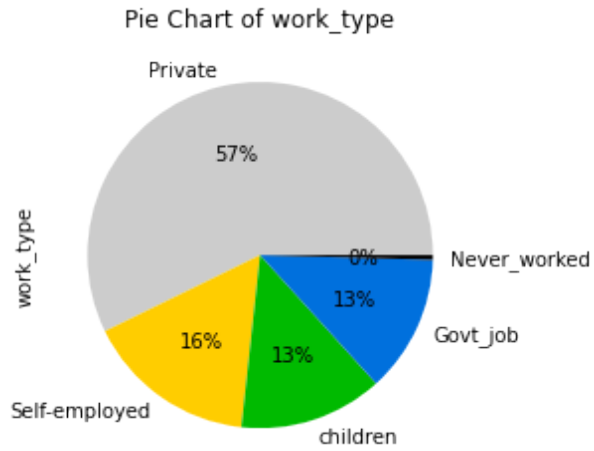
In [41]:
```
plt.figure(figsize=(8, 6))
sns.countplot(data=df, x='Residence_type',)
plt.xlabel('Residence_type')
plt.ylabel('Counts')
plt.title('Residence_type Counts')
plt.show()
```



Pie chart for Work Type

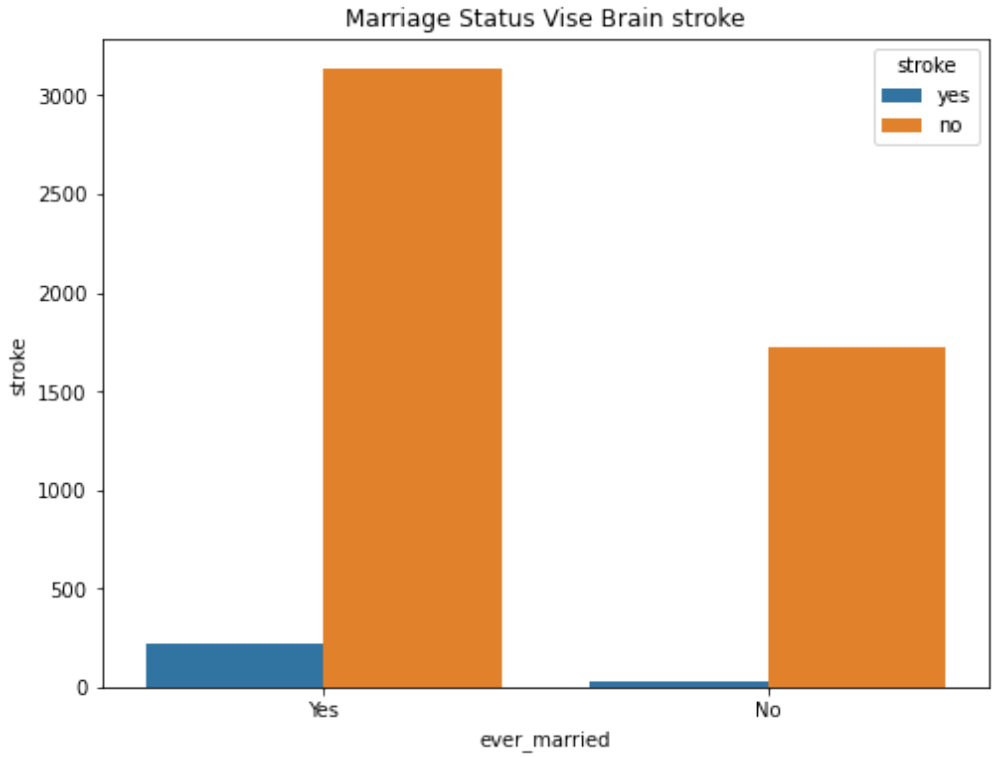
In [42]:
```
df['work_type'].value_counts().plot(kind = 'pie' , title = 'Pie Chart of work_typ
                                    autopct="%.0f%%", colormap='nipy_spectral_r')
```

Out[42]:
```
<AxesSubplot:title={'center':'Pie Chart of work_type'}, ylabel='work_type'>
```



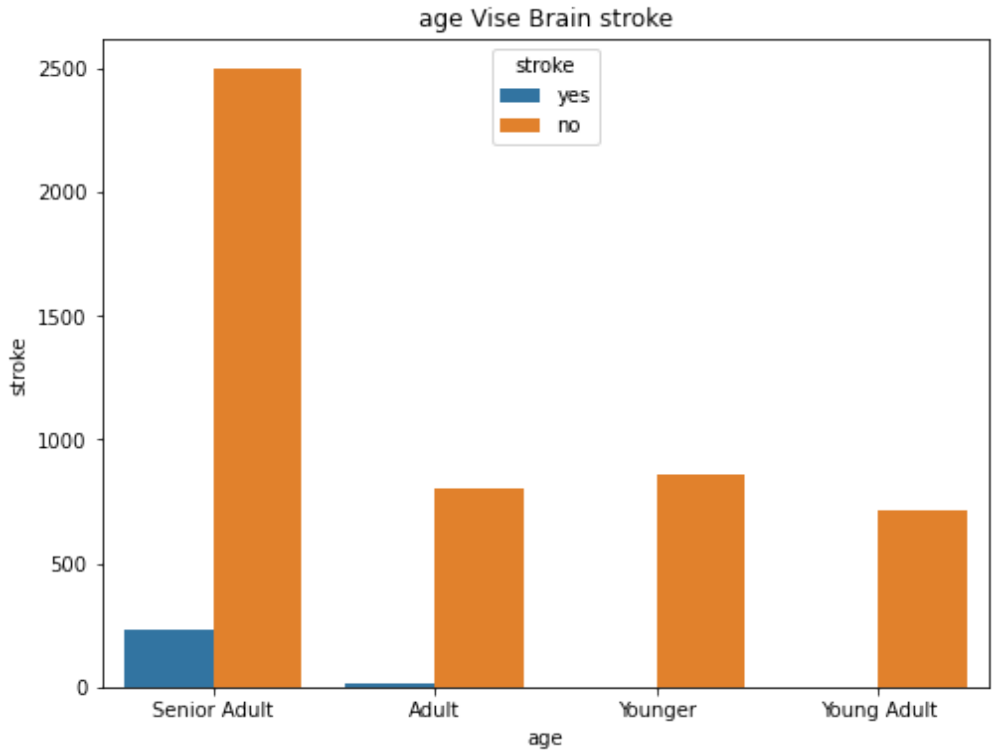
Count of Married Wise Brain Stroke

In [43]:
```
plt.figure(figsize=(8, 6))
sns.countplot(data=df, x='ever_married', hue ="stroke")
plt.xlabel('ever_married')
plt.ylabel('stroke')
plt.title('Marriage Status Vise Brain stroke')
plt.show()
```



Count of Age Wise Brain Stroke

In [44]:
```
plt.figure(figsize=(8, 6))
sns.countplot(data=df, x='age', hue ="stroke")
plt.xlabel('age')
plt.ylabel('stroke')
plt.title('age Vise Brain stroke')
plt.show()
```



Count of Age Wise Smoking Status

In [46]:
```
plt.figure(figsize=(8, 6))
sns.countplot(data=df, x='age', hue ="smoking_status")
plt.xlabel('age')
plt.ylabel('smoking_status')
plt.title('Age Vise Smoking Status')
plt.show()
```